Sustainability education: addressing practice and attitude

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ABSTRACT: This paper reports on the rationale for and the structure of the MSc in Theory and Practice of Sustainable Design, a new postgraduate course at the University of Cardiff. The course seeks to prepare students to take a pro-active approach informed by the principles of sustainability in their line of work and be able to address the barriers to the implementation of sustainable development including those relating to design and procurement process as well as those relating to attitudes and values of individuals and society.
The course rationale builds on research into attitudes towards sustainability and ethical consumerism and research that considers how changes in values can be achieved. The course introduces students to the history and theory of sustainability, ethics and attitudes to sustainability, legal and financial frameworks. It addresses practical aspects of procuring sustainable buildings within the existing building industry and considers community and urban sustainability, energy and water efficient building design and sustainable materials. The course seeks to broaden views and challenge values and encourage sustainable lifestyles, while providing a sound practical foundation in sustainable building design and implementation.

Keywords: education, sustainable building, ethics, history and theory, building procurement

1. INTRODUCTION

The concept of sustainable design has evolved from it beginnings in the 1970s, which focussed on energy efficiency, to currently encompassing principles of resource efficiency, waste and pollution minimisation, community building, health and well-being. Today we understand sustainable design to apply to urban design as well as individual buildings and we acknowledge that to create sustainable communities all aspects of everyday life have to be considered.

The technological developments of the past thirty and more years have brought advances in the field of energy efficiency, renewable energy technologies, efficient water supply and sewage design. Experience from all around the world has informed the development of sustainable design strategies and methods and today case studies worldwide demonstrate how to implement sustainable design principles. Despite all of this knowledge and experience sustainable building is still not mainstream.

The barriers to achieving sustainable development solutions include cost, procurement and sometimes technical issues, but there is also still widespread ignorance about the issues that affect sustainability. Furthermore preconceptions exist that working towards a sustainable community is an issue for professionals only, a work-related task and often someone else's responsibility. Personal initiatives towards sustainability are regarded by some as worthless: a drop in the ocean that will change very little globally. Even individuals involved in sustainable design or research work sometimes fail to apply the sustainability principles they consider in their work to their personal life.

In other words: individuals' attitudes are a significant barrier to sustainability becoming mainstream. Sustainability is still seen as a positive addition rather than an essential and basic requirement. An ethical imperative to be sustainable does not exist at the moment and only when and if sustainability gains an ethical dimension will sustainable lifestyles and building developments become mainstream. As stated by Parkin of the Forum for the Future: 'If sustainability is to be achieved, the ethics and values that support it will be just as important as scientific and technological advance.' [1]

The MSc in Theory and Practice of Sustainable Design at Cardiff University aims to address the barriers to a wider adoption of sustainable design principles including those linked to attitudes and outlooks. The underlying theme of the course emphasises the importance of intervention at a personal as well as a professional level and encourages students to develop a clear ethical position in respect of sustainability. The course also provides practical knowledge designed to enable students to overcome technical and procurement barriers to sustainable development and identifies the opportunities open to students from different fields of work.

2. THE INSTITUTION

Located in Cardiff, the capital of Wales, the Welsh School of Architecture at Cardiff University is a well-established centre for sustainability in the built environment providing, in addition to the teaching of sustainability, a consultancy and research service for the building industry in Wales and internationally. The teaching of sustainability occurs at undergraduate and graduate level and is integrated within the architectural curriculum. The school's existing masters programme includes an MSc in Environmental Design of Buildings that has been running for over a decade and focusses on the energy efficient design of buildings. The new MSc in Theory and Practice of Sustainable Design has a broader remit considering design and procurement aspects at a theoretical level and enabling students to implement their newly acquired skills in practice by working on real live projects. Both MSc courses share a new introductory module called Frameworks for Sustainable Design covering the history and theory of sustainability and introducing the factors linked to society that affect sustainable development. This new module has been running since 2005 and the new MSc in Theory and Practice of Sustainable Design will begin in September 2006. The course welcomes students from all disciplines in the built environment, including building design professionals, local authority planners and client representatives, but also those interested in the building environment from other environmentally-related disciplines.

3 THE COURSE RATIONALE

3.1 Addressing barriers to mainstream implementation.

The considerations that defined the nature of the new MSc and drove its development focussed on the problems of implementing sustainability in mainstream practice. As discussed above these are not limited to technical and design-related issues, but include procurement practice and importantly personal attitudes and ethical positions. The course was therefore developed to provide students with the knowledge and skills as well as the outlook to enable them to drive change towards a sustainable future in their own field.

3.2 Addressing attitudes.

That the course should help students develop a strong personal vision for sustainability was thought critical in the present culture that generally fails to support sustainable actions and lifestyles. Currently interest in sustainability is low as reflected by a survey of consumer's awareness of information about sustainable products undertaken by the UK the Consumer Council. This showed that one third of young people and a quarter of individuals with lower incomes had never come across any such information and only less than one fifth of the over 1800 individuals interviewed actively sought such information [2]. In fact, current social structures are conducive to unsustainable lifestyles rather than supporting sustainability. As identified by Jackson in the Briefing document *Motivating Sustainable Consumption* for the Sustainable Development Research Network [3] the symbolic nature of consumer goods allows individuals to express status, identity, social cohesion, and allows the pursuit of personal and cultural meaning. However, the expressions of status currently expressed primarily through wealth and power are often associated with unsustainable lifestyles including excessive consumption. For sustainability to become mainstream it is necessary that the values that govern social interactions are rethought. Living a sustainable life and, additionally for those in the building industry, helping to create sustainable environments has to be seen as the only ethically acceptable way to act. Without strong social pressure principles are too easily compromised as soon as problems arise. If compromising sustainability were seen as deeply unethical, most people, reluctant to go against the prevailing way of thinking, would avoid them. A sustainable society is still only a vague possibility in the distant future and to operate against the tide of existing thinking, for example by accepting lower profits on a building development, requires clarity of purpose, determination and courage.

3.3 Formulating a clear vision.

Clarity of purpose is what the new course seeks to help students develop. In particular the Frameworks for Sustainable Design module gives an overview of sustainability including issues not directly related to the built environment and encourages students to consider their responsibilities as individuals and professionals.

The potential need for students to change their mindset and view life from a different point of view was also identified. Not all students have an idea of what constitutes a sustainable built environment or lifestyle and may have little experience of how to life in a sustainable manner. Changing habits may, however, be difficult to achieve. Jackson points out that the force of habit can make change appear impossible and even the need for change appear invisible. He also suggests that breaking unsustainable lifestyle habits can be achieved by making lifestyle choices more conscious and that information can be successful in inspiring positive action. For instance, information on global warming and how it can be mitigated through personal interventions can trigger a more sustainable personal use of energy. The course offers a view of life that is different from that which confronts most people every day. It provides opportunities to discuss sustainable living and building in relation to different cultural contexts and personal limitations within a group, enabling an exchange of information and ideas between students.

3.4 Acquiring practical knowledge and skills.

To be effective practitioners promoting sustainability in their field, students have to match their outlook and clarity of purpose with practical and technical skills and know-how. It is critical to be aware of not only technical theory and examples of

successful implementation, but also potential pitfalls of introducing sustainable solutions. The course discusses established and new means of procuring, designing and constructing sustainable buildings and provides the students with an opportunity to apply their newly acquired knowledge on a real live project.

4 THE COURSE STRUCTURE AND CONTENT

4.1 Course outline.

The course is run as a full-time one year masters course or two year part-time. It is composed of six taught modules and a research dissertation. Each taught module involves six or seven half day sessions run by specialist staff and invited speakers. Some of the modules will also be run as CPD modules for practitioners in Wales. The development of the CPD modules was funded through the Knowledge Exploitation Fund, supported by the Welsh Assembly Government and European Union Structural Funds, which aims to enhance the knowledge transfer between educational institutions and industry.

The course constitutes four teaching and leaning stages. The first addresses the students' outlook, the second stage involves the provision of information and the last two provide students with an opportunity to apply the knowledge in practice. The first stage is made up of the introductory module Frameworks for Sustainable Design, which sets the scene and begins the dialogue with the students regarding their position in respect of sustainability and their responsibilities. Three further modules provide technical and practical knowledge and are followed by a double module designed for students to apply their knowledge in practice. The last stage involves a research or design dissertation providing opportunities for research or a further application of knowledge through design.

4.2 Stage one.

The Frameworks for Sustainable Design module aims to introduce students to the concepts of sustainability in its widest sense. The module begins with an overview of the state of the planet in relation to sustainability. With this context in mind the values, beliefs and assumptions relating to sustainability are introduced and discussed. This is done in parallel with an introduction to environmental ethics and social justice and a historic review of sustainability, from the early environmental movement to today's sustainability initiatives. The module then introduces other aspects of the social framework that affect society's understanding of and potential for implementing sustainability, including community, urban, legislative, economic and political issues. It also discusses sustainable working methods such as holistic thinking, critical needs analysis and value engineering. The module uses case studies of completed developments to contrast different theoretical positions adopted in the building industry and relate them to their practical implementation.

Through lectures, seminars and discussion the module provides a structure for students to develop, discuss and formulate their personal sustainability standpoint. The course work is also designed to encourage this process. Right at the start of the course students are asked to formulate their views in respect of sustainability including where they see their responsibilities and opportunities for action to lie. These Personal Sustainability Statements are distributed among students who have to comment on their peers' statements. A revised statement is then rewritten at the end of the course and may even form the basis for a dissertation on a student's personal and professional development throughout the course. Students are also asked to calculate their ecological footprint and assess their opportunities for reducing it as well as social initiatives that would facilitate such reductions. The final coursework element requires students to select a topic for a short research paper that is presented in a conference-like setting. This allows the students to develop in-depth knowledge of a new topic encountered throughout the taught sessions and further develop their personal interests and standpoint in respect of sustainability.

4.3 Stage two.

The second stage modules are designed to provide information relevant to the practice of the students, whether they are designers, clients, control officers or environmentalists interested in the built environment. The modules' content is outlined in Table 1 and addresses all aspects of the building process from the initial client brief, through to the construction of the development.

The modules provide detailed information on specific topics and focus on sources of information for others. At the end of the three modules students are expected to be able to select appropriate design and procurement approaches to maximise the potential for realising sustainable developments. The course work for these modules gives the opportunity for members of different disciplines to develop expertise relevant to their work. For instance, the Process of Sustainable Development module requires students to produce a document that relates to building procurement within their field of work, be it a project brief for a client representative, specification for an architect or a waste minimisation plan for a contractor.

4.4 Stage three.

This stage of the learning process involves applying the knowledge acquired in previous modules to a live project. This will be a learning-by-doing approach within which a critical reflective learning process will be employed. Students from different disciplines will be working as a team, learning about others and themselves while implementing holistic principles to real situations. This stage, as with the first stage of the course, will encourage students to question their understanding of sustainability and discuss their position in relation to real constraints and the often unavoidable need for compromise. Working with concrete constraints will not only expand the student's understanding of the challenges associated with practice, but also support critical and creative thinking. Responding to the real needs of individuals will help students identify, understand and address other people's priorities.

MODULE 2 - PROCESS OF SUSTAINABLE DEVELOPMENT

- Industry structure and attitudes. Barriers and benefits of sustainable development initiatives.
- Legislation, development guidance, financial incentives, grant supports, and making an economic argument.
- Benchmarking, setting targets and monitoring progress.
- Assessments, post-occupancy monitoring, certifications.
- Pre-contract issues: employers briefs, selection of project team and contract, community consultation and participation.
- Design and procurement issues: Sources of information, 'Green' building specification, assessing environmental information, developing 'green' supply chains.
- Sustainable site practice: Waste minimisation, Health and Safety, supporting local industry, cost benefits of sustainable site practice.

MODULE 3 – SUSTAINABLE DEVELOPMENT DESIGN

- Selecting sustainable materials: impacts of material manufacturing, use and disposal. Use of renewable, certified, recycled, reused, natural and low energy materials
- 'Green' material certification schemes, regulations, standards and warranties, resourcing locally and alternative construction.
- Heath and buildings: comfort and well-being, indoor air quality, independence and identity and restorative environments.
- Waste minimisation through design, on-site good practice, closed loop material construction, waste minimisation in use.
- Minimising water needs, rainwater and grey water recycling, sustainable urban drainage and sustainable sewage treatment.
- Reducing energy needs through building envelop design, passive heating and cooling, thermal mass and seasonal heat storage, planting as climate modifiers.

MODULE 4 – SUSTAINABLE BUILDING SERVICES

- Strategic design of building services, CIBSE Guide F, role of the environmental designer; examples of environmental analysis.
- Heating systems: design of efficient heating systems; CHPs, high efficiency boilers, fuel cells.
- Lighting design: daylight and low energy lighting, controls, assessment of energy saving potential.
- Design of efficient distribution systems, assessment of energy saving potential.
- Low energy cooling technology: principles of operation and assessment technique guidelines.
- Heat Pumps and Air Conditioning Systems.
- Renewable energy systems: integration into buildings; principles of operation and assessment technique guidelines.
- Efficient control and use of services: Building Management Systems, Monitoring and Targeting, future developments.

Table 1: Outline of modules focussing on practical strategies, technologies and methods for achieving sustainable developments (Refer to section 4.2 & 5.1 for Module 1 and section 4.4 for Modules 5&6).

The live project is made possible through collaboration with members of the building industry, including architects, planners and developers. It is envisaged that under the supervision of the teaching team the students would contribute to a particular work stage of a project. The project could relate to one or more buildings or an urban design intervention. The work stage could constitute a pre-project research exercise, a stakeholder consultation process, brief writing, setting targets, assessment of existing design proposals and recommendations for sustainability improvements, payback analysis, a feasibility design proposal, detailed design research or post-occupancy evaluations.

Initial interest and agreement for collaboration has been confirmed by representatives of Cardiff County Council, a local architectural practice and a developer active in Cardiff.

4.5 Final stage.

The final dissertation stage allows students to specialise through research or design in an area of their choice, becoming specialists in their chosen field of study.

5 STUDENT FEEDBACK

5.1 Module content.

The Frameworks in Sustainable Design is critical in terms of the course's aim of helping students achieve clarity of thoughts and purpose. It provides the students with general information on sustainability and the social constraints that affect it by covering the following topics:

- Environmental and social concerns.
- Concepts, principles and historic developments.
- Environmental ethics, social justice and professional ethics.
- Sustainable communities and urban environments.
- Politics, economics and environmental law.
- Implementation approaches to sustainable design: strategies and methods.

In addition three sessions are included where invited practitioners talk about their work.

5.2 Student feedback.

Students' feedback from the first year of running the Frameworks for Sustainable Design module has been sought through questionnaires and informal discussions as well as extrapolated from the students' course work. Twelve students attended the course. Similar feedback will be sought in future for the whole course.

The feedback questionnaire asks general questions concerning the module and includes three questions relating to its content.

1. How appropriate was the module's starting level to your previous knowledge and ability?

2. How much has this module contributed to your general understanding of environmental design?
3. How much has the module contributed to your practical skills in the environmental design?

The responses were scored from 1 (low) to 5 (high) and additional comments were invited. The first question, with a response average of 3.6, reflected the view of some students who clearly felt it was unnecessary to reiterate the reasons for promoting sustainability. However, the response to question 2, with a response average of 4.2, suggested that even those who felt they knew about the subject were still able to expand their knowledge.

In relation to the practical knowledge gained from the module (question 3 with a response average of 3.6) a few students expressed their lack of interest in the topic of ethics and social justice, regarding these to be of little relevance to their life and day to day activities. Others on the other hand commented on the fact that they were unaware of the environmental ethical debate and had found the topic thought-provoking.

Informal feedback supported the general view that practical knowledge was of greater interest than the more theoretical knowledge, perhaps to be expected from those in the field of building design and construction. In fact, one student suggested that, as many of her peers had no idea how to reduce their personal ecological impact, a session on 'the sustainable citizen' would be beneficial.

5.3 Student course work.

The students' course work proved very revealing in respect of their prior knowledge and development throughout the module. The Personal Sustainability Statements revealed a widespread initial misconception of what constitutes sustainability. Several students had been considering mainly, if not exclusively, energy efficiency. Typical sentiments shared by several of the students are shown in Table 2.

Table 2: Extracts from students' Personal Sustainability Statements.

- *Before I began studying this module, my opinion of sustainability is so one-sided and disordered that I merely supposed that the sustainability is an issue which is just related to energy crisis, global warming and pollution etc.*

- *…..when I was an undergraduate student in my university and was required to design some project with conception of sustainable design, just some superficial methods were adopted, such as planted roof for compensation of green area, sealed openings for energy efficiency and so on.*

  What is worse, at that time, is that I supposed I had equipped my project with all of strategies of sustainable design.

5.4 Changes to the programme.

While most of the feedback supports the approach taken teaching this module, some changes in line with the students' preference for practical approaches will be implemented. The following two additional topics will be covered:

- Maximising day-to-day personal contributions.
- Attitudes and educating for sustainability.

The first will advise students on improvements they can implement in their personal life. The second will help to put across to the students the problems associated with the widespread lack of knowledge and interest in sustainability and the importance of understanding the principles of environmental ethics and social justice as a means of changing attitudes.

Furthermore the ethics and social justice sessions will be run as a group debate where practical building-related scenarios will be discussed in relation to ethical principles and social justice rather than a seminar discussing ideas and principles. The module will also be slightly reconfigured to require students to read about topics in advance of the weekly sessions, thus leaving more of the contact time for discussions and debates.

6 CONCLUSION

The new MSc in Theory and Practice of Sustainable Design could be seen to reflect a second, perhaps more mature, phase of the implementation of sustainability as a global society. Technical solutions exist, but are not enough to bring sustainability to mainstream life. Legislation can be effective, but is unpopular with governments concerned with their future popularity. New skills are required to operate within this context.

This second implementation phase requires professionals that are able to implement change, not only propose it. Sustainable practitioners have to know about technical fixes and be able to implement solutions in a holistic manner in a social context that is still hostile to changes towards sustainability. The course aims to prepare students for the reality that awaits them and strengthen their resolution to make a change, personally and professionally.

REFERENCES

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